Growth, Degrowth, or Green Growth?
In Search of a Better Paradigm

Climate Lecture

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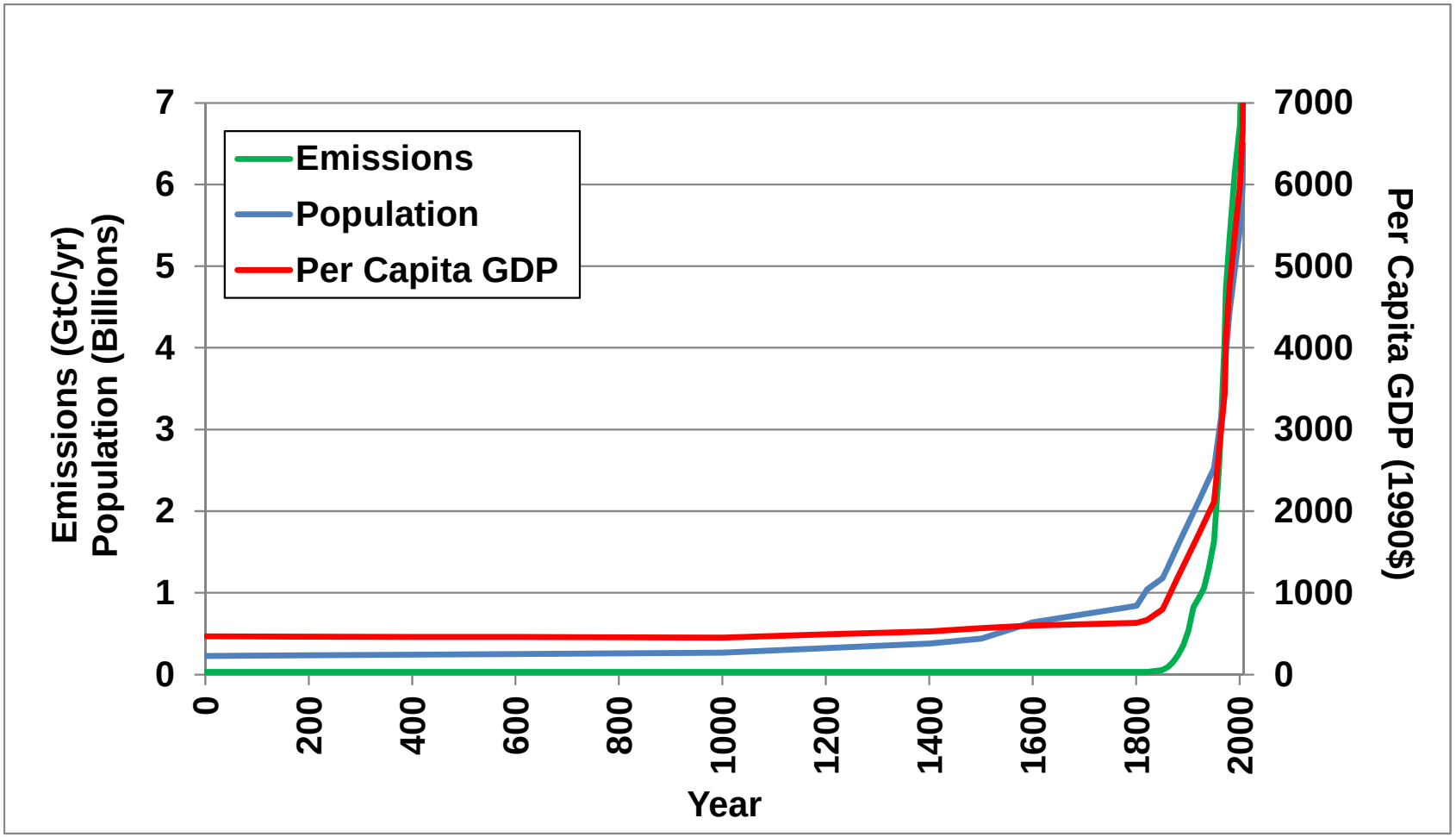
INTERGOVERNMENTAL PANEL ON climate change
WMO UNEP
Working Group III (WG III) – Mitigation of Climate Change

Outline

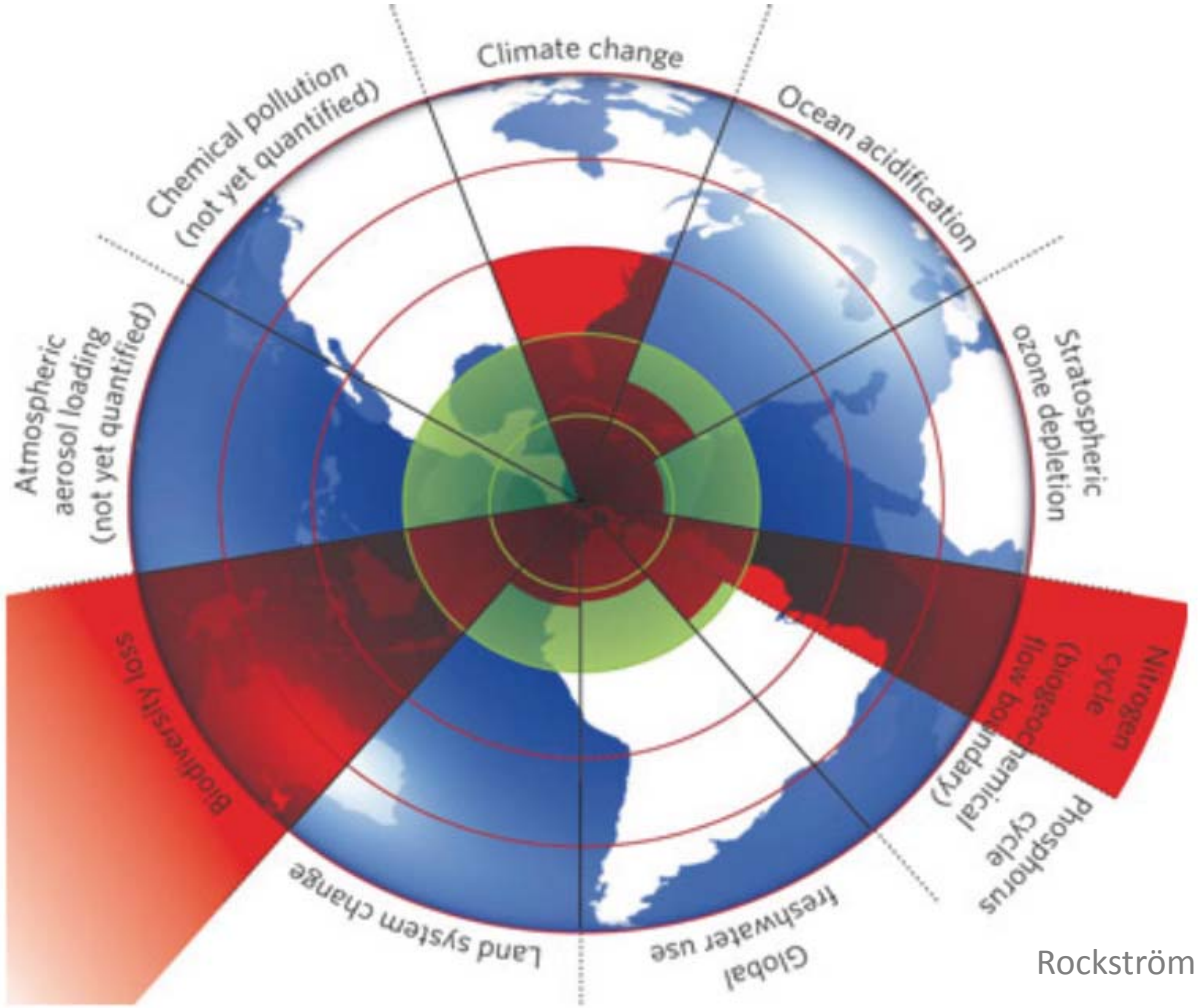
1. Is continued economic growth *feasible*?
2. Is continued economic growth *desirable*?
3. Commons as a new paradigm
4. Conclusion

Economic Growth in Perspective



Edenhofer et al. (2012)

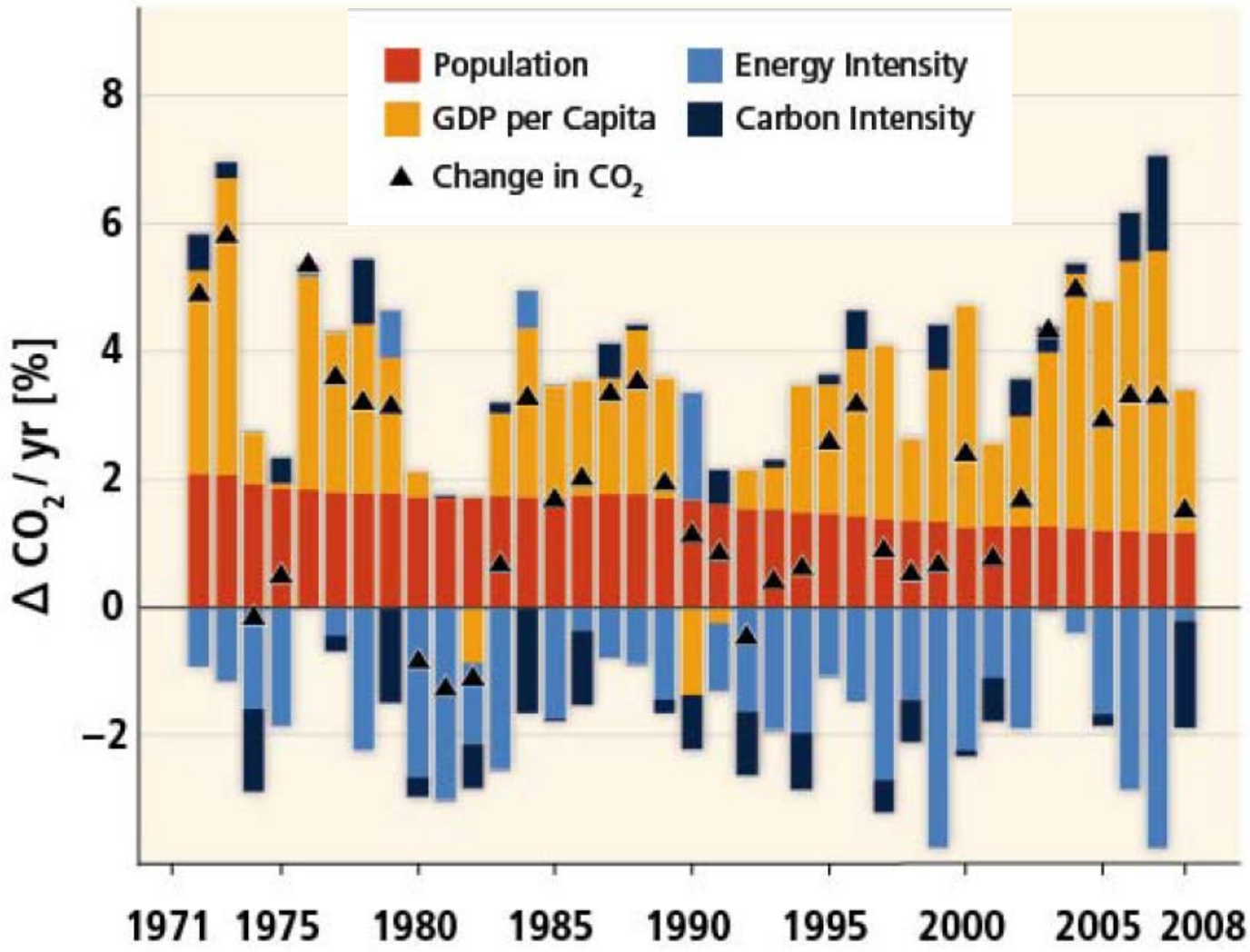
No Limits to Economic Growth?



Rockström et al. (2009)

Danger of overstepping “planetary boundaries”?

What drives Emissions?



SRREN, Edenhofer et al. (2011)

Economic growth – particularly in newly industrializing countries – drives global emissions !

Green Growth to the rescue?

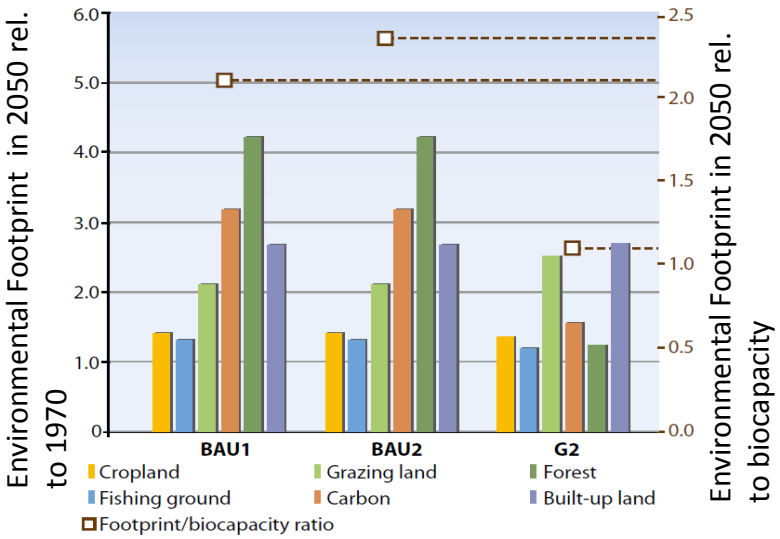
Can we keep up economic growth and still protect the environment?

What is Green Growth?

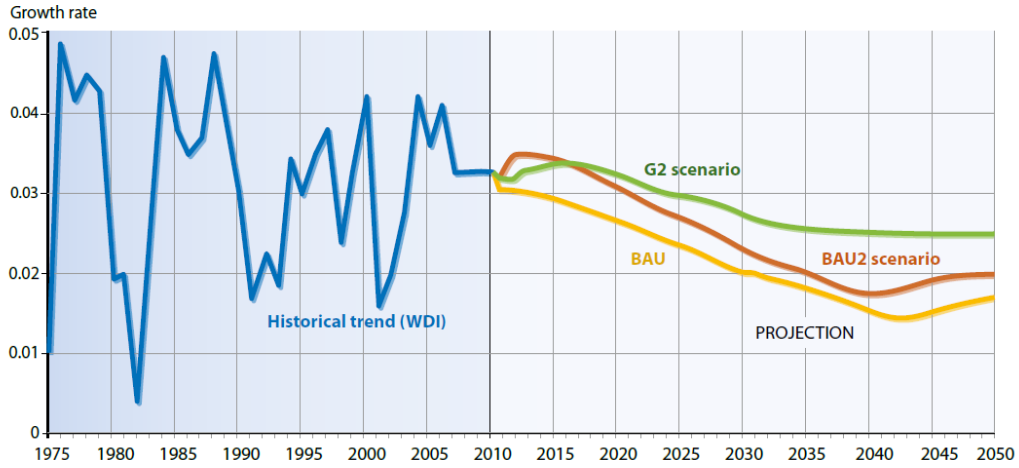
- "Green growth […] is about fostering economic growth and development while *ensuring that natural assets continue to provide* the resources and environmental services on which our well-being relies" (OECD 2011).

- "UNEP defines a green economy as one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. […] The key aim for a transition to a green economy is to *eliminate the trade-offs* between economic growth and investment and gains in environmental quality and social inclusiveness" (UNEP 2011).

UNEP‘s Green Growth Scenario



Having your cake…



… and eating it, too!

This scenario results in a no-regret outcome, i.e. higher economic growth even if the environment wouldn‘t matter.

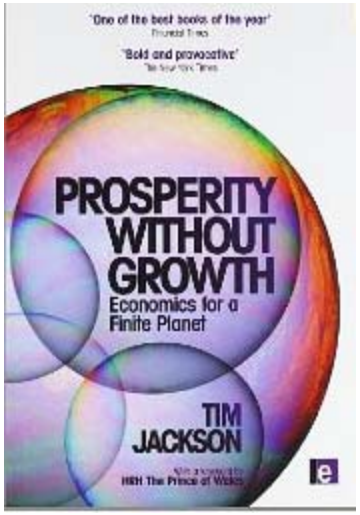
Has been criticized for unrealistic assumption of additional investment that drives up growth (Victor and Jackson 2012).

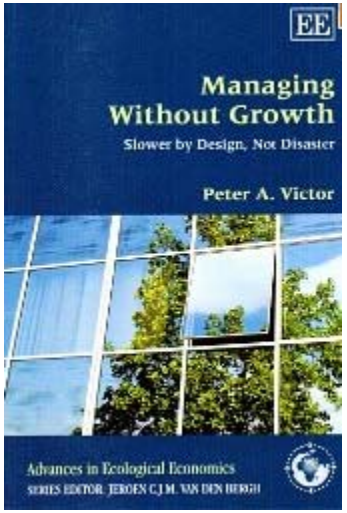
Green Growth is not a sharply defined concept, and it lacks empirical verification…

… so maybe degrowth promises a more straightforward solution to reduce emissions?

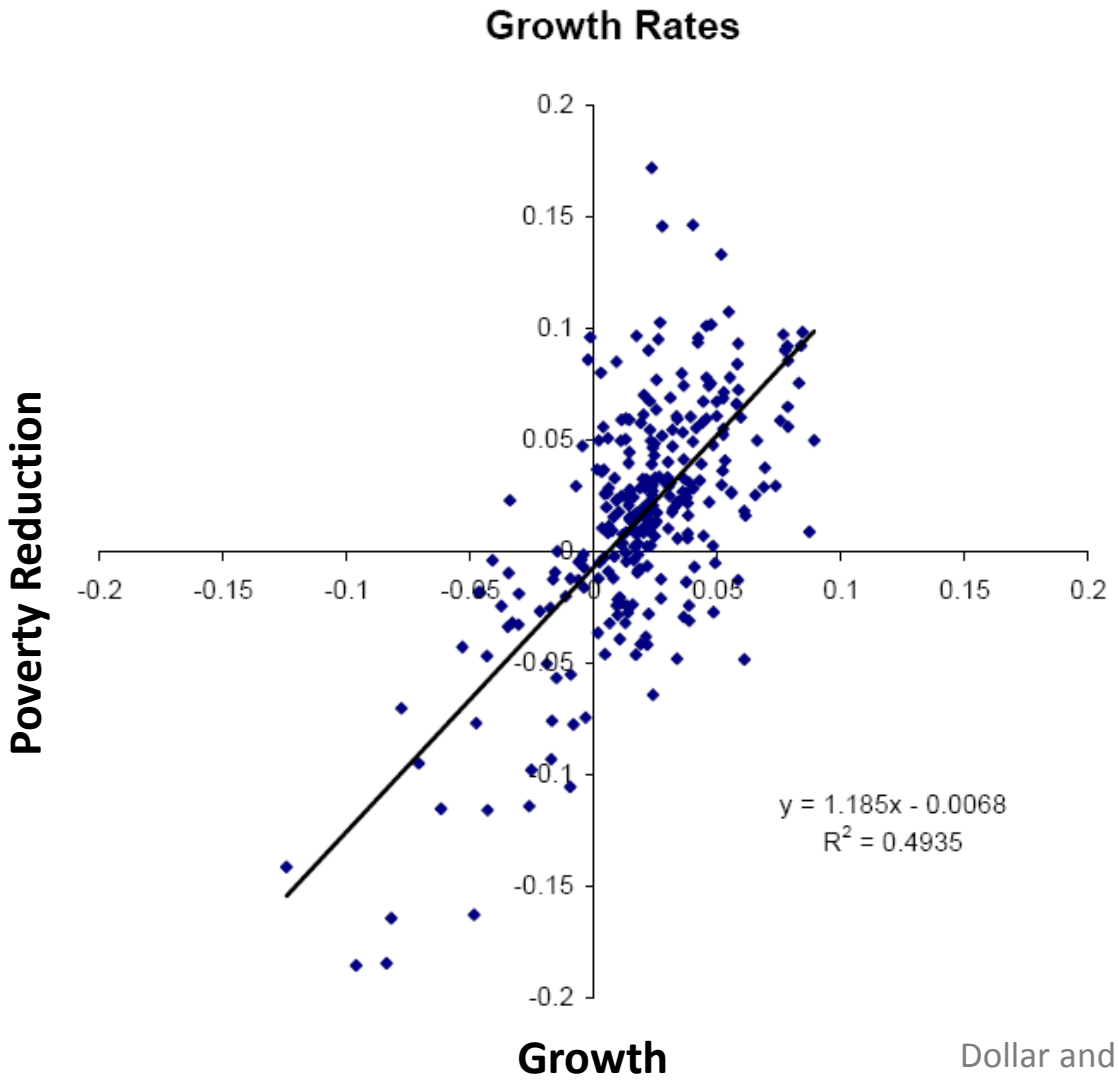
"Degrowth" is at least conceivable as a new post-materialistic lifestyle in industrialized countries…

… but how should degrowth be put into practice in poor countries?





Growth and Poverty Reduction



- People mired in absolute poverty: >1 billion.

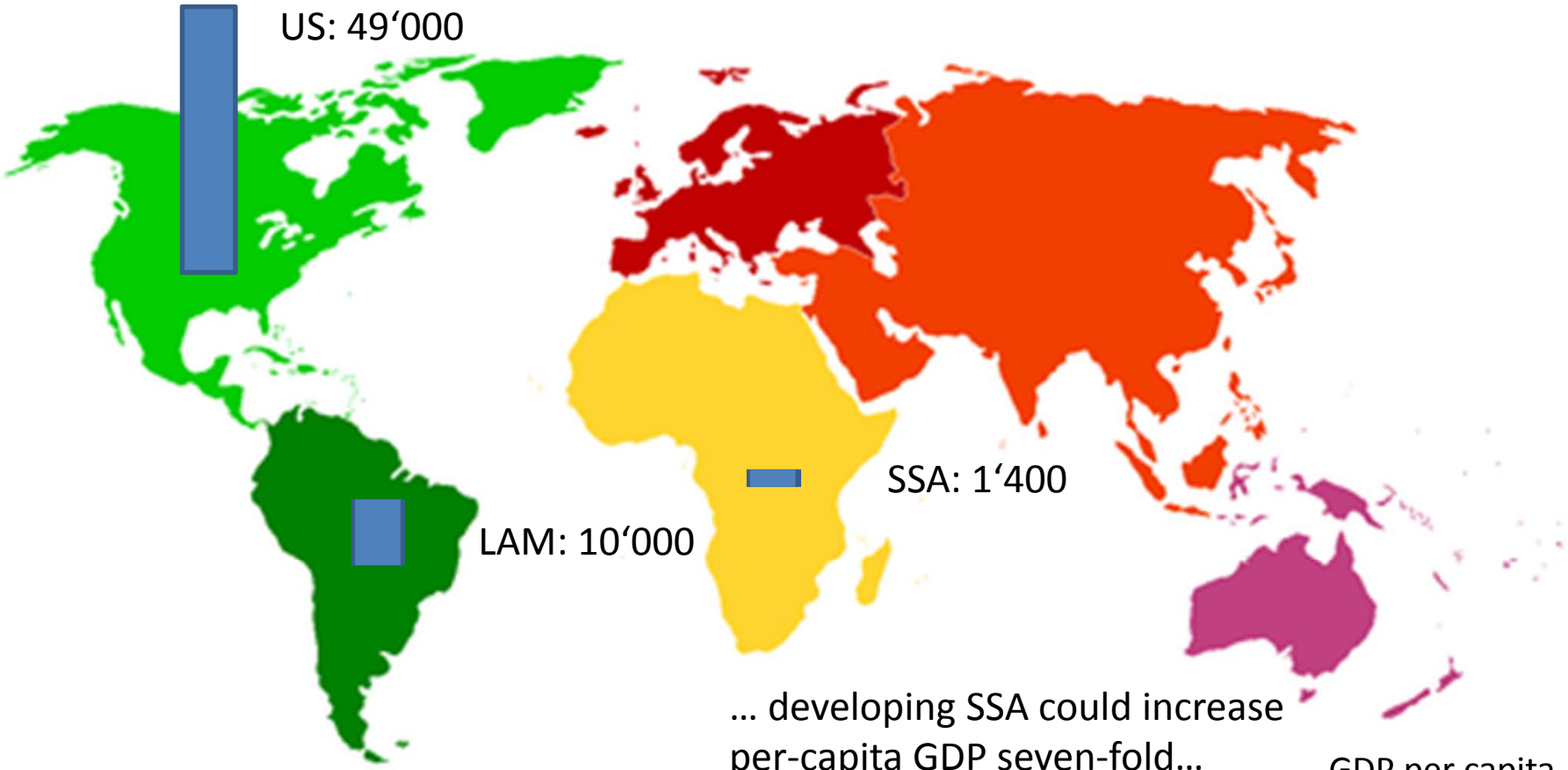
- Without economic growth, chances to escape poverty are diminished.

Dollar and Kray (2002)

What does Degrowth mean for Income Distribution?

… and the US would have to degrow by about 80%

If global income were distributed equally…



… LAM would remain at the current level…

… developing SSA could increase per-capita GDP seven-fold…

GDP per capita in current US$

(Source: WDI 2012)

What does Degrowth mean for Income Distribution?

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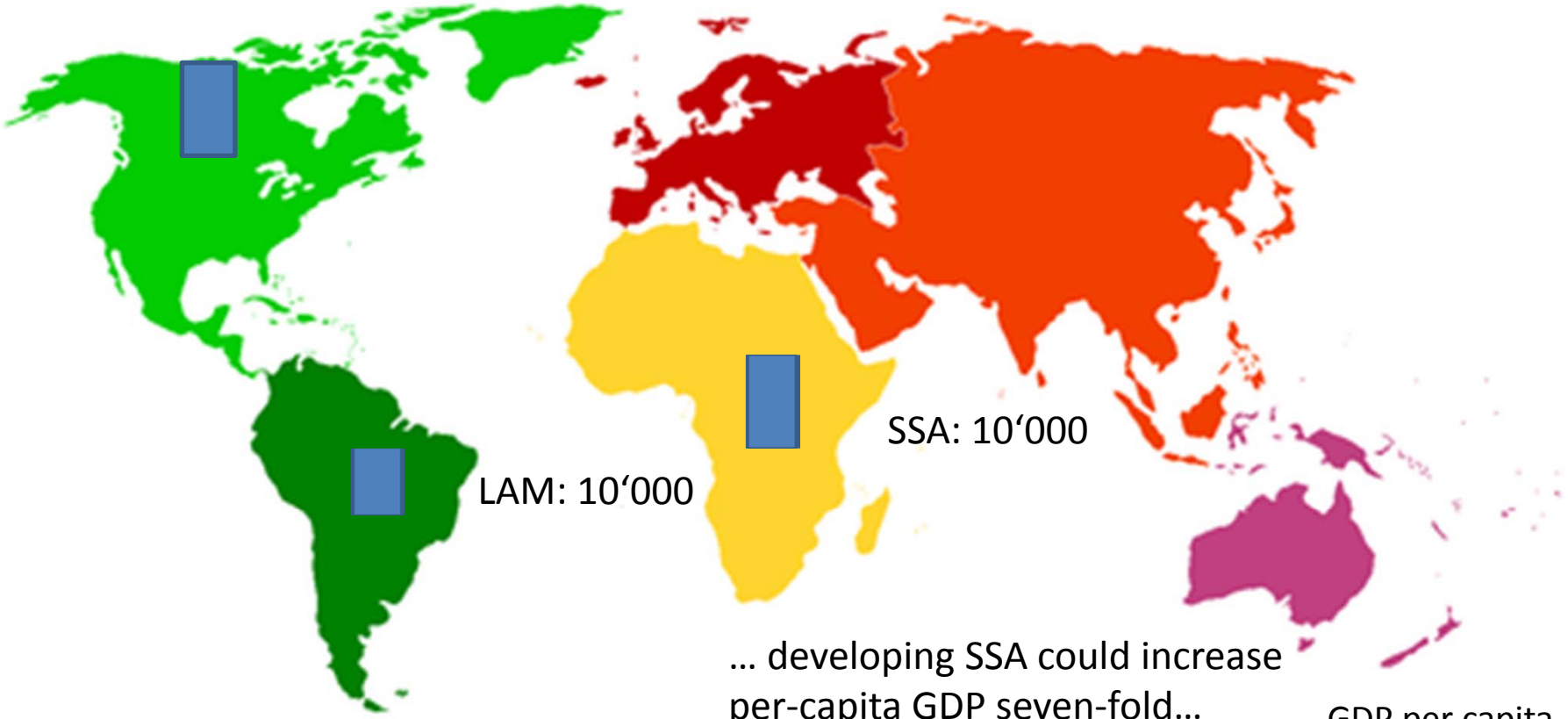
If global income were distributed equally…

US: 10‘000



LAM: 10‘000

SSA: 10‘000

… developing SSA could increase per-capita GDP seven-fold…

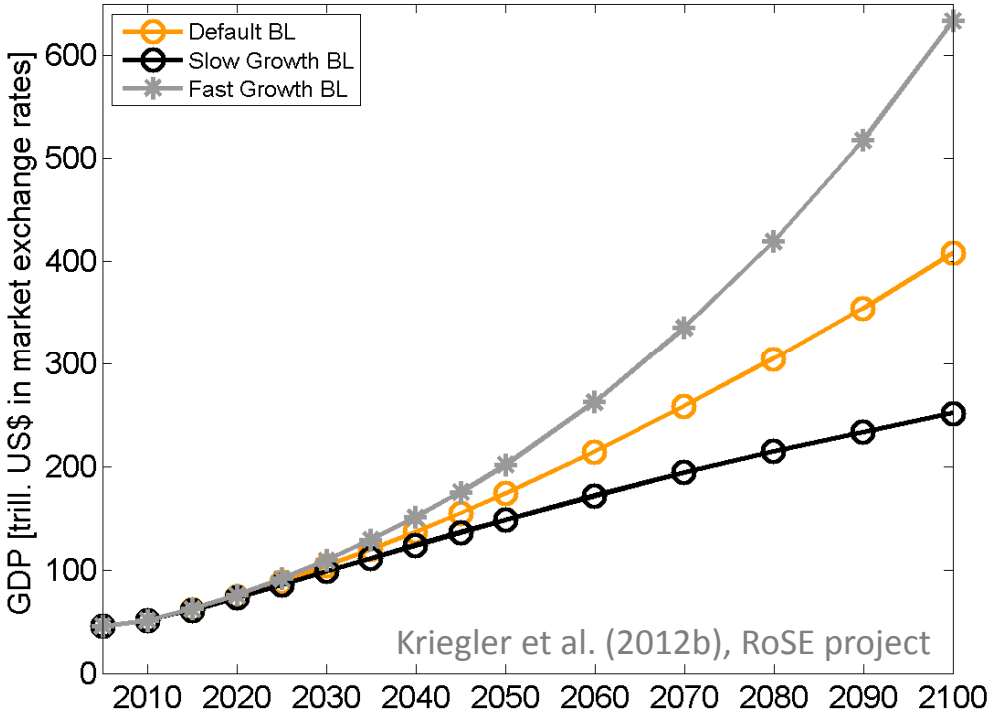
… LAM would remain at the current level…

GDP per capita in current US$

(Source: WDI 2012)

High and Low Growth

Scenarios for global GDP development



Drivers of growth:

⇒ Population

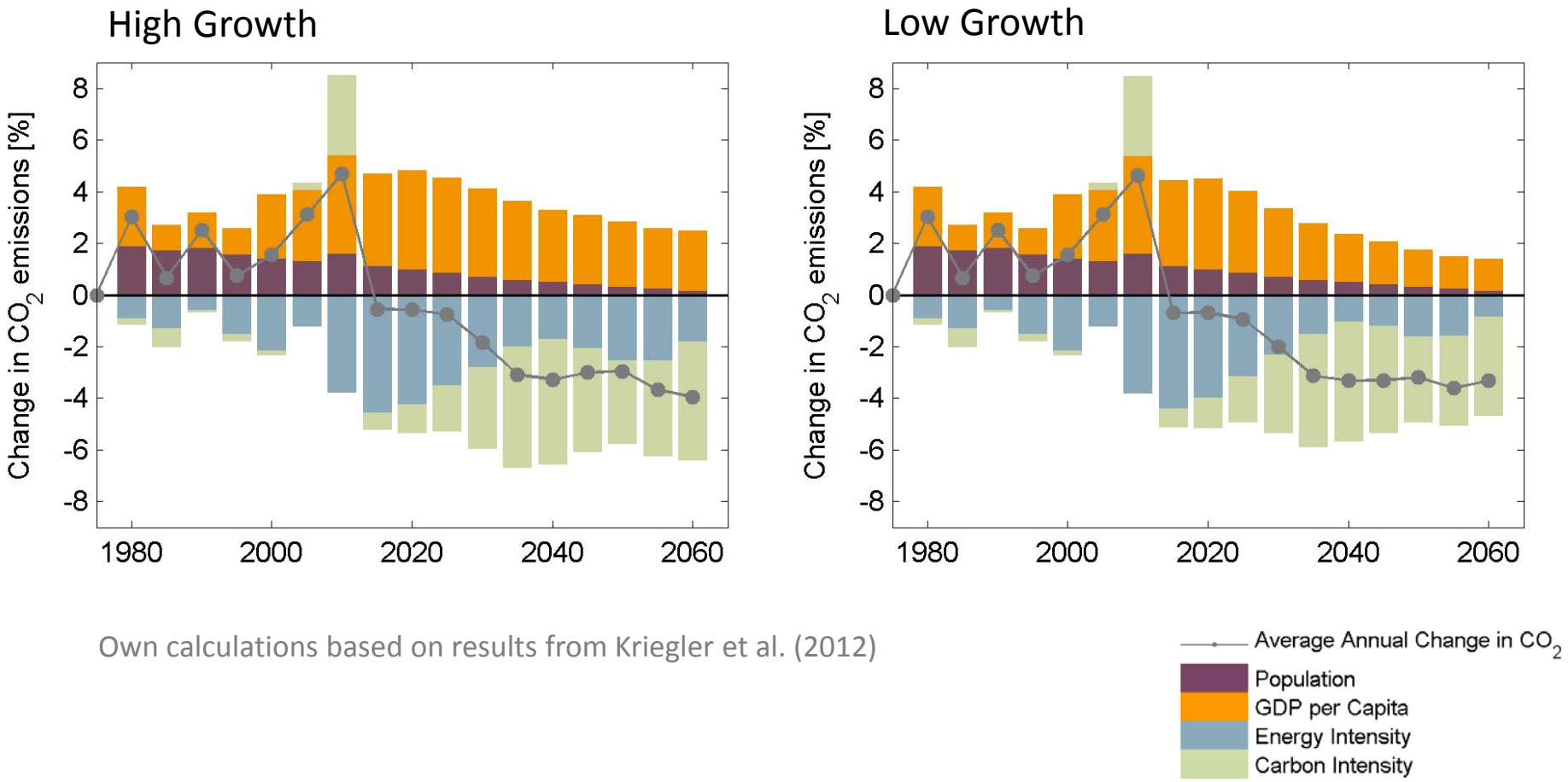
⇒ Labour participation rates (age, gender, …)

⇒ Human capital (schooling, …)

⇒ Productivity growth

⇒ Capital accumulation

450ppm-e with High and Low Growth

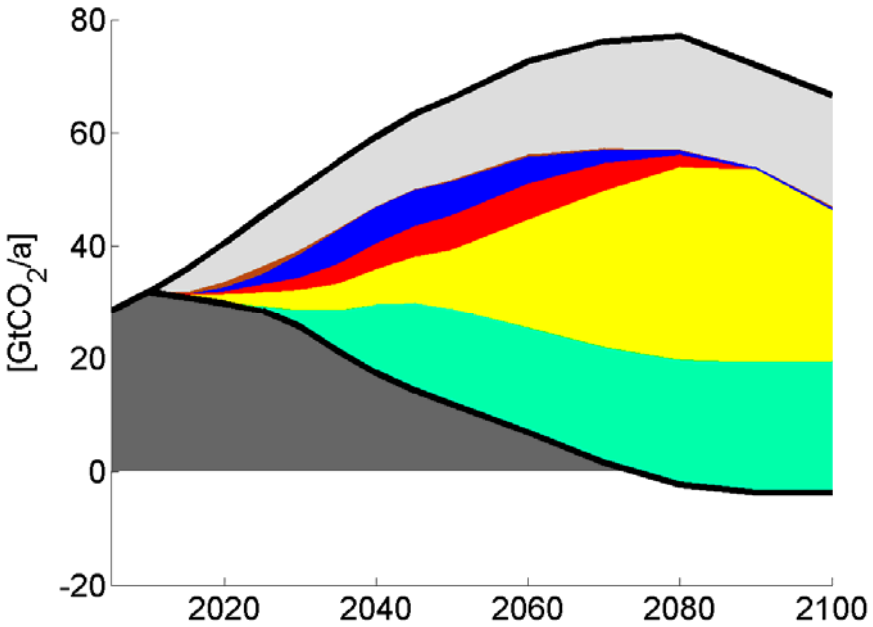


Own calculations based on results from Kriegler et al. (2012)

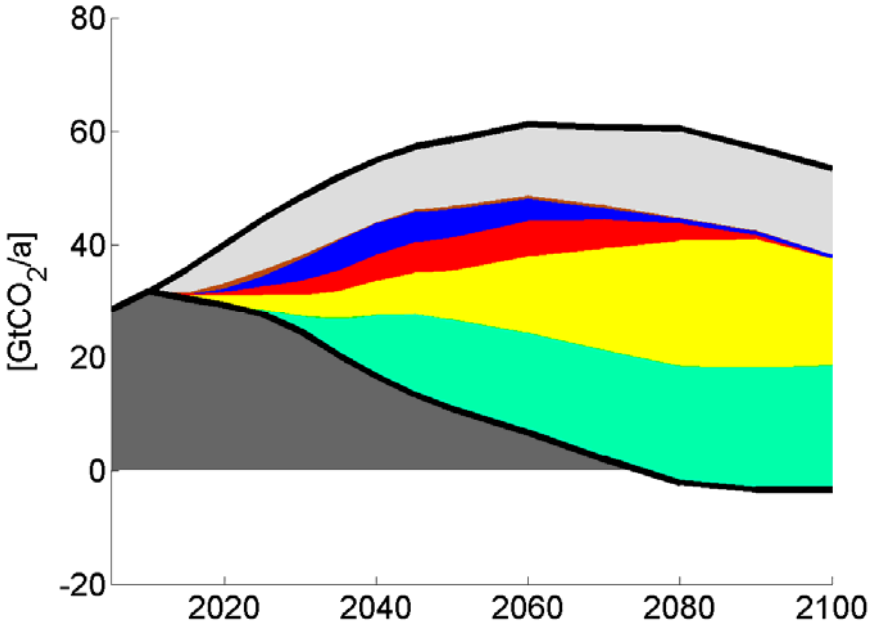
Higher **economic growth** has to be compensated by higher **energy** & **carbon** intensity improvements

Technology Differences due to Economic Growth

High Growth

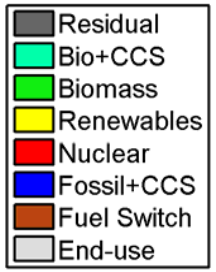


Low Growth



Kriegler et al. (2012a), RoSE project

Luderer et al. (2012)



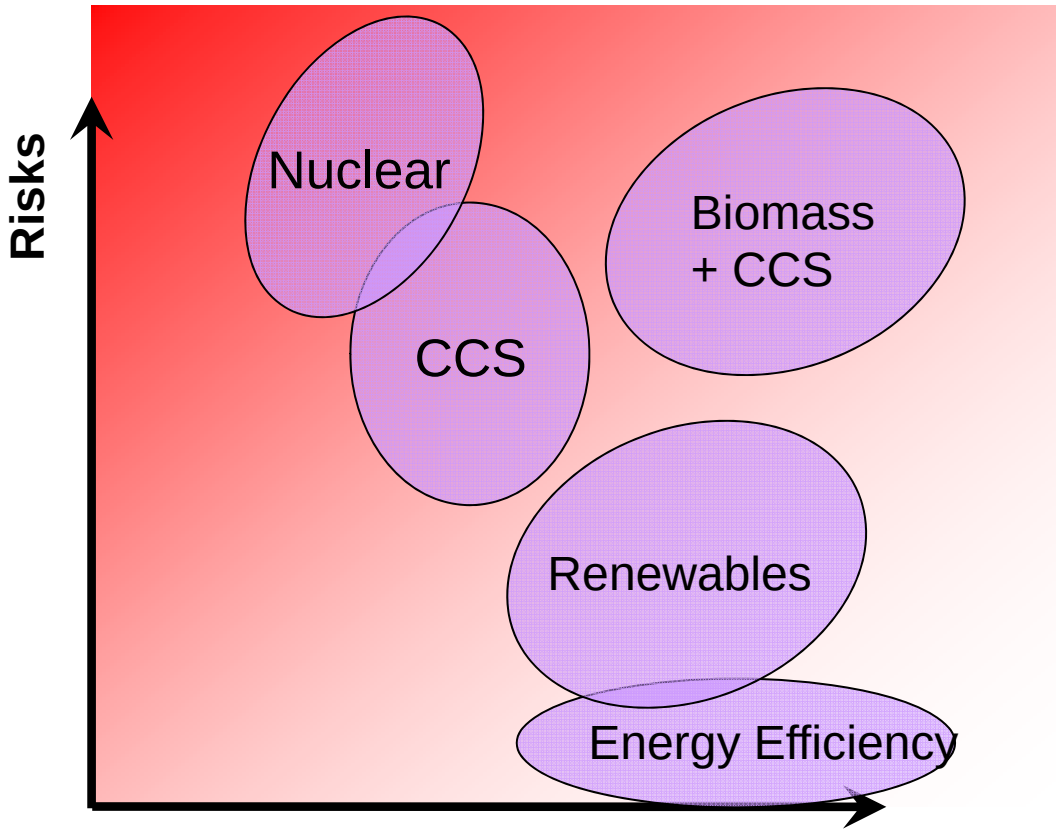
Higher economic growth requires
more **efficiency improvements** and **renewables**

Limiting global warming to <2°C requires reducing carbon intensity of GDP (CO_2/US$) by ~4-7% per year. Degrowth might reduce the needed annual reductions by maybe 2%...

… but where should the other roughly 2-5% come from?

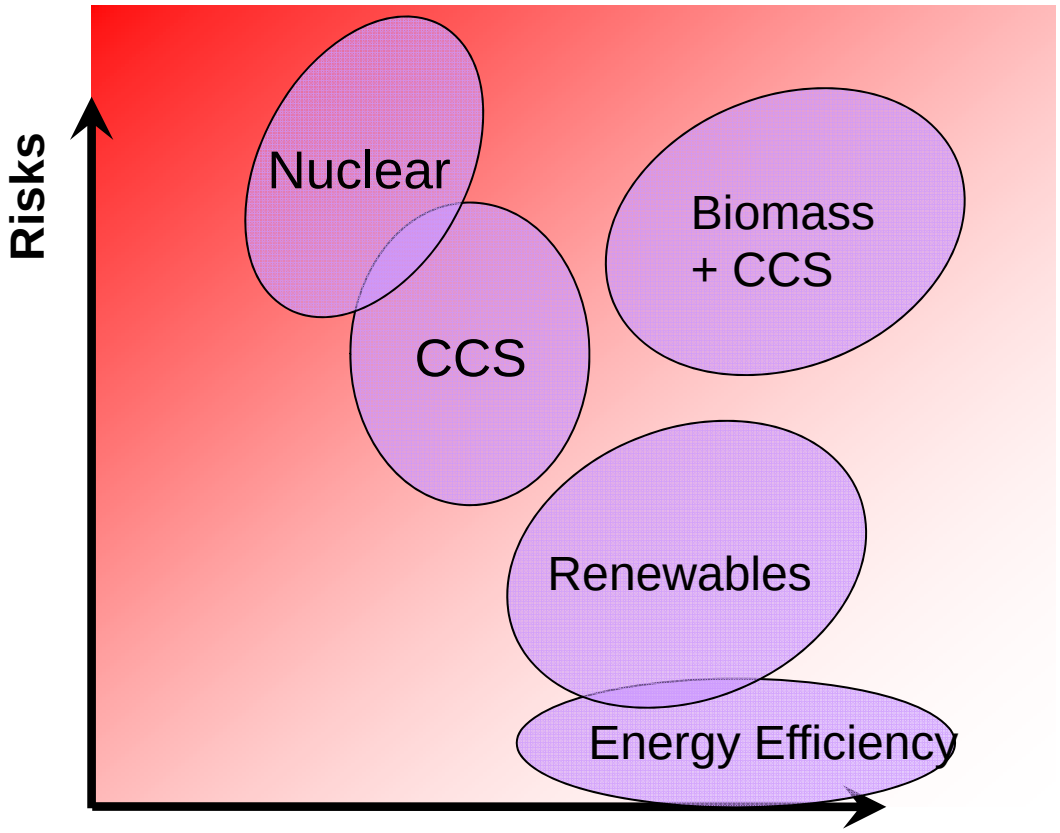
Opportunity Costs vs. Risks

High Growth Scenario



Opportunity Costs vs. Risks

Low Growth Scenario



A degrowth strategy would reduce these risks at best indirectly…

…and we have to distinguish the *ends* that a policy should achieve from its *means*.

Policy Instruments

- Carbon pricing (e.g. carbon tax, emissions trading)
- Technology policies (e.g. feed-in tariffs, R&D subsidies)
- Insurance schemes
- Land-use management

If all environmental goals can be reached and technological risks addressed by appropriate policy instruments, why deliberately slow down economic growth?

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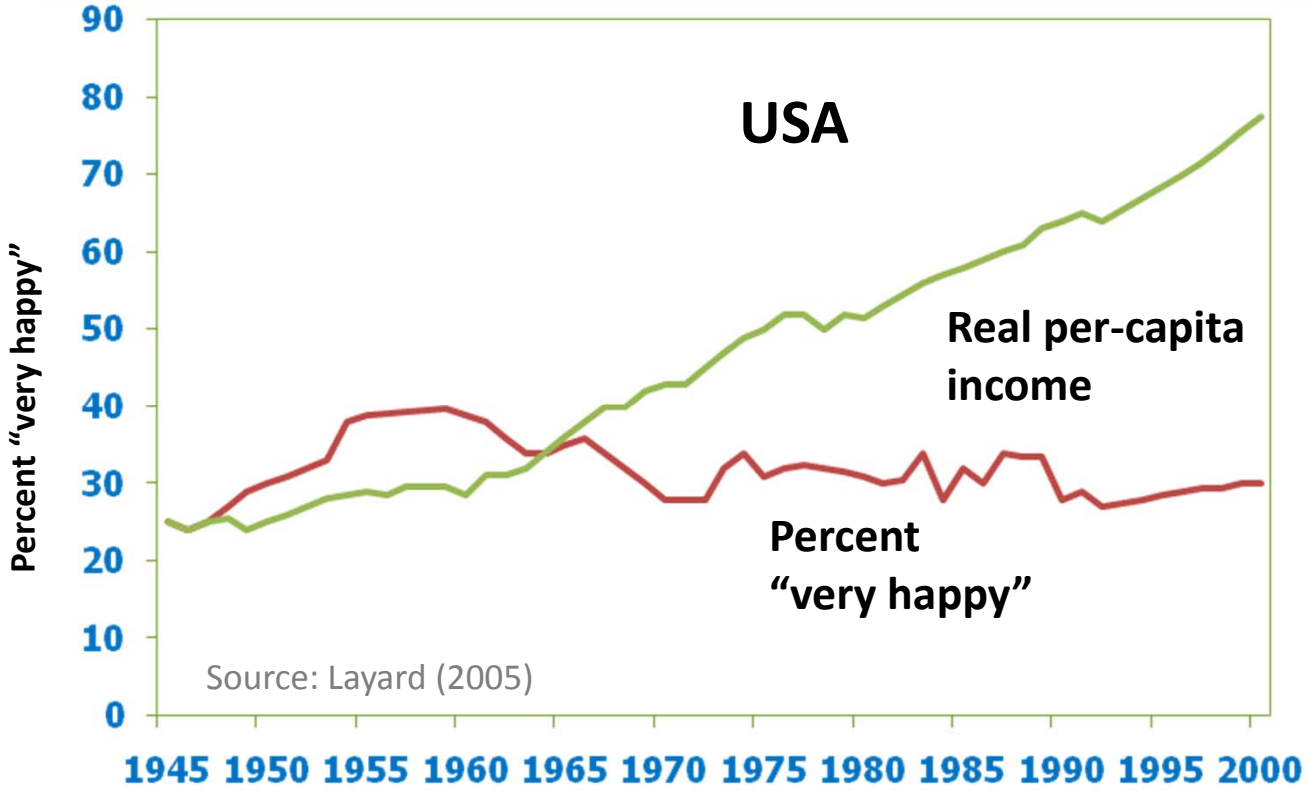
GDP is only partially related to Well-Being



However, this so-called Easterlin-Paradox is contested, as it suffers from data and measurement problems, does not take into account increases in life-expectancy, and might not be valid in cross-country studies.

In any case, growth cannot constitute a goal in itself, but it might help to attain things that increase well-being.

What *are* Key Factors of Well-Being?

Two showcase results…

For the individual, the most important correlates of happiness are:

- Family relationship
- Financial situation
- Work
- Community and friends
- Health
- Personal freedom
- Personal values

Layard (2005) from U.S. General Social Survey Data

80% of the differences in life satisfaction can be explained by:

- Divorce rate
- Unemployment rate
- Trust in other people
- Membership in voluntary organisation
- Quality of government
- Belief in God

Helliwell (2004) using World Values Survey Data

What *are* Key Factors of Happiness?

(Wilkinson and Picktett, 2009)

For rich countries, inequality might be more important than absolute per-capita income

Hence, growth might not be desirable per se, but there is no reason to restrict economic growth directly…

… and we need to think about how we define social welfare in the first place instead!

What is the currently used Welfare Indicator?

- By „historical accident“ and a lot of positive feedback it is this:

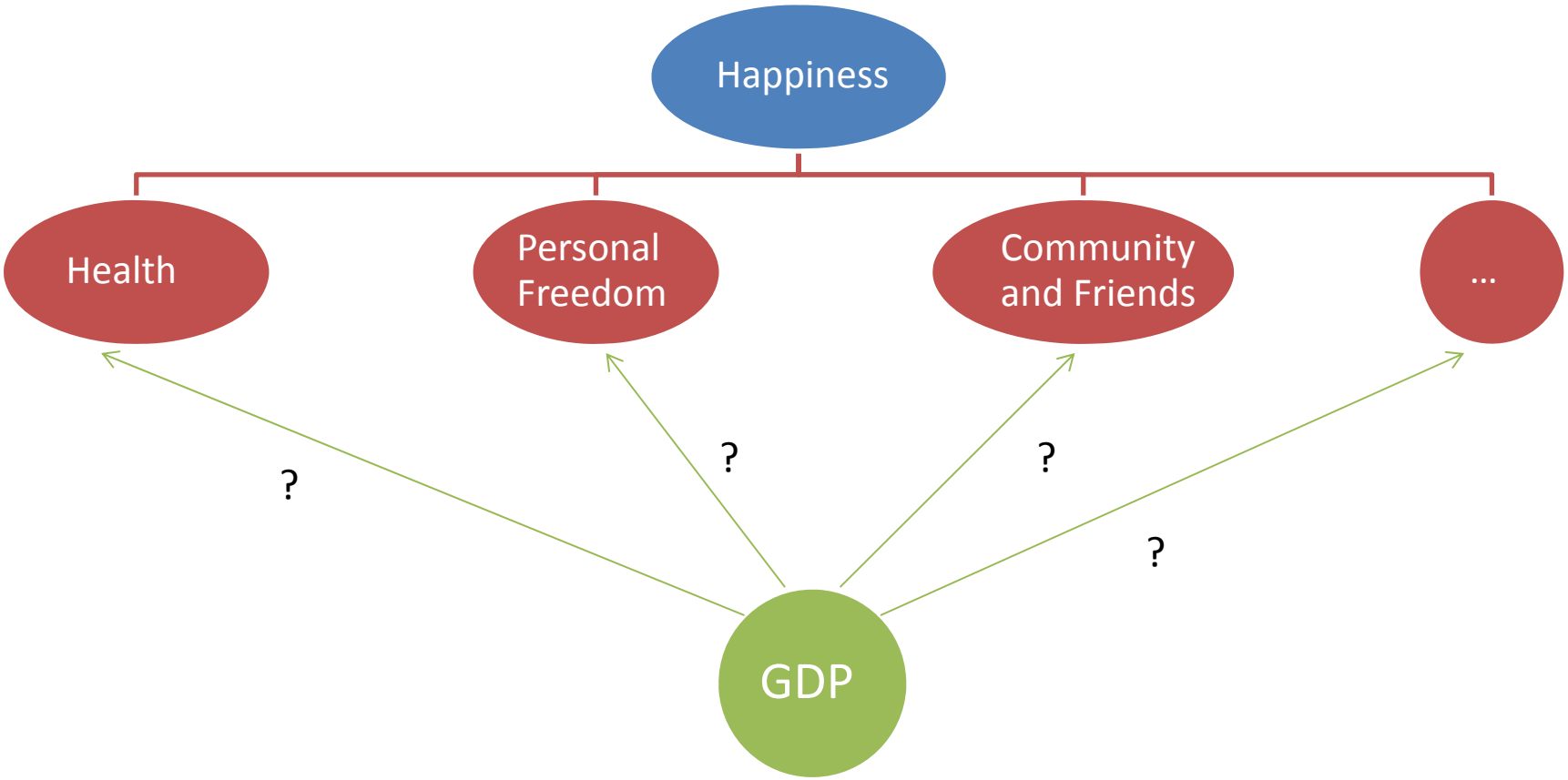
GDP=

The monetary value of all the finished goods and services produced within a country's borders over a year’s time.
GDP = C + I

- **GROWTH PARADIGM:** By the logic of many political actors, growth in GDP is a welfare improvement and the solution to social (and environmental?) problems.

- `Heterodox‘ Economists believe that this is inappropriate for affluent societies, although it may be correct for the developing world.

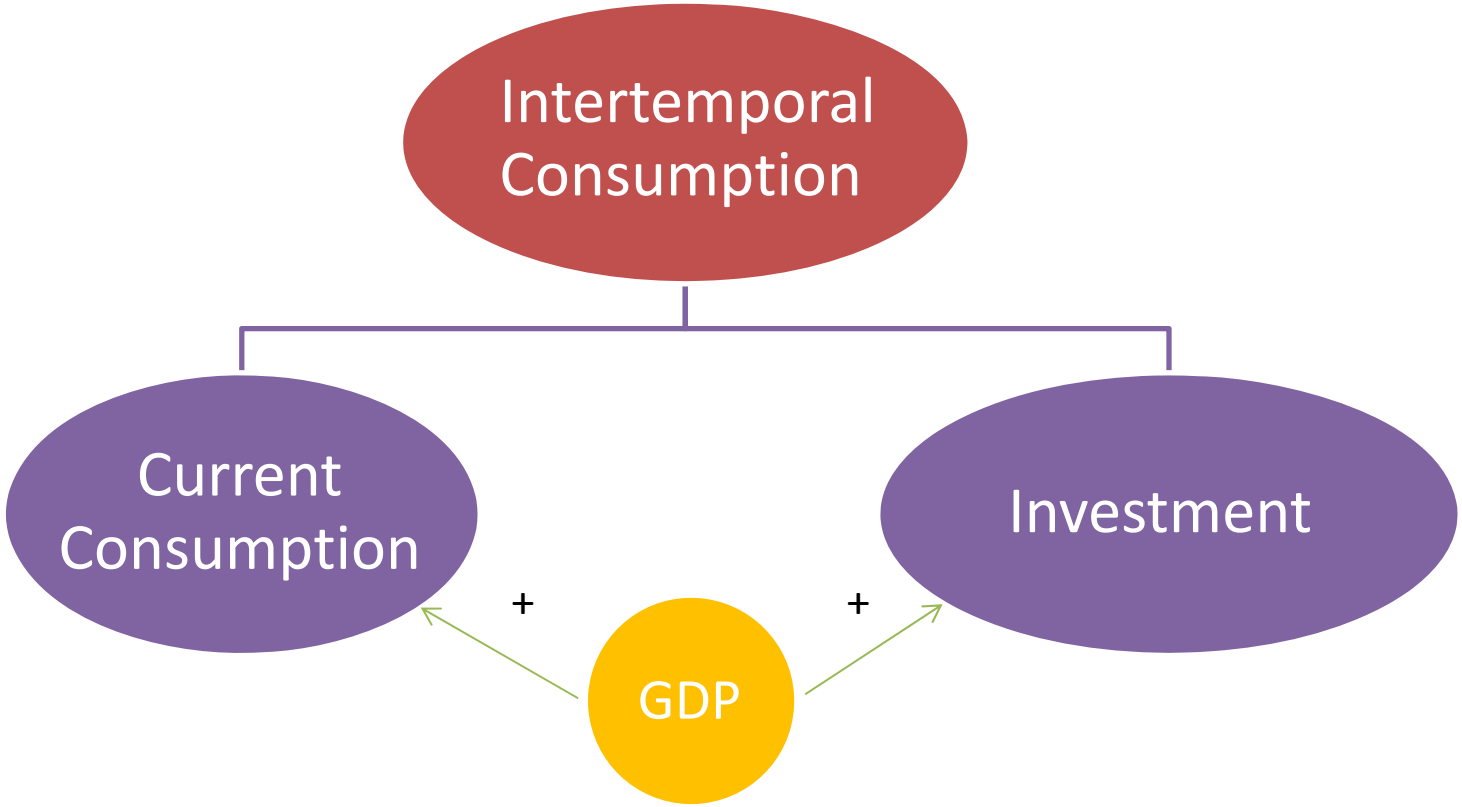
Social Welfare as Happiness



Social Welfare as material Well-Being

Consider the most simple case (only physical capital)

- utility: $\int_0^{\infty} U(C_t)e^{-pt}dt$
- GDP is a function of the (physical) capital stock: $F(K_t)$
- capital dynamics with zero depreciation: $I = \dot{K}_t = F(K_t) - C_t$



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GDP Alternatives: Sustainability

Maximization of utility:

- Hamiltonian: $H = U(C_t) + \lambda\,(F(K_t) - C_t)$
- Assume linear utility: $U(C) = U_c C$
- Hamiltonian in terms of dollars: $H / U_c = C + I$

→ NNP equals (approximately) the Hamiltonian

- Definition of net national product in this case: $NNP = C + I$
- That is, in this special case $NNP = GDP$

→ If welfare only depends on consumption, GDP is a welfare measure

Net National Product - Public Goods

Setup of the Problem

- utility: $\int_0^\infty U(C, G)e^{-pt}\,dt$
- capital dynamics with zero depreciation: $I = \dot{K} = F(K) - C - G$

Maximization

- Hamiltonian: $H = U(C, G) + \lambda\,(F(K) - C - G)$

→**NNP includes public capital:** $NNP = H/U_C = C + G + I$

Net National Product - Climate Policy through a Carbon Budget

Setup of the Problem

- utility: $\int_0^{\infty} U\,(C)\; e^{-pt}\mathrm{dt}$
- investment with pollution as production input: $I = F\,(K, P) - C - G(P)$
- finite disposal space in the atmosphere S: $\dot{S} = R = Q(S) - P$

Maximization

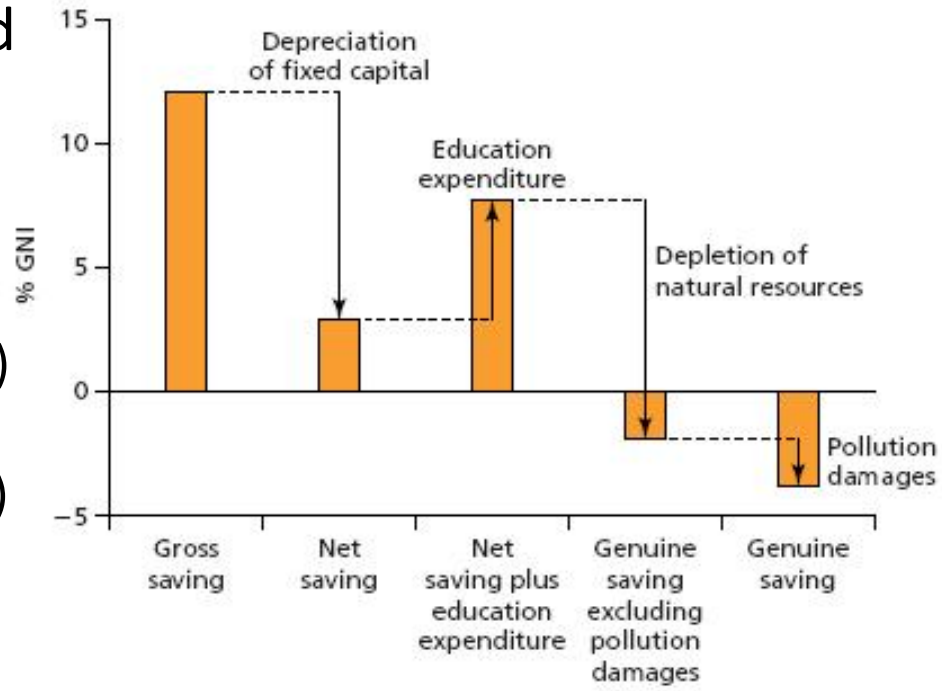
- Hamiltonian: $H = U(C) + \lambda\,(F(K, P) - C - G\,(P)) + \mu\,(Q(S) - P)$

→ NNP includes changes in total pollution, weighted by marginal benefit of pollution: $H/U_C = C + I + (F_P - G_P)\dot{S}$

Where is the Wealth of Nations?

- World Bank introduced "Adjusted Net Savings"

- Correct gross investment (I_1) for:
  - Depreciation of physical capital (-δK)
  - Investment in education (I_2)
  - Depletion of natural resources (-RF_p)
  - Pollution damages (-RG_p)



World Bank (2011)

→ $NNP = C + I_1 + I_2 - \delta K - RF_p - RG_p$

Central question for sustainable growth: can NNP be consumed in one period without undermining the ability to produce the same NNP in the future? (Hicks, 1946)

Are we consuming too much?

Table 1

Genuine Investment and Components as Percentage of GDP

Country	Domestic net investment	Education expenditure	Natural Resource Depletion: Damage from CO_2 emissions	Natural Resource Depletion: Energy depletion	Natural Resource Depletion: Mineral depletion	Natural Resource Depletion: Net forest depletion	Genuine investment
Bangladesh 1973–2001	7.89	1.53	0.25	0.61	0.00	1.41	7.14
India 1970–2001	11.74	3.29	1.17	2.89	0.46	1.05	9.47
Nepal 1970–2001	14.82	2.65	0.20	0.00	0.30	3.67	13.31
Pakistan 1970–2001	10.92	2.02	0.75	2.60	0.00	0.84	8.75
China 1982–2001 (without 1994)	30.06	1.96	2.48	6.11	0.50	0.22	22.72
Sub-Saharan Africa 1974–82; 1986–2001	3.49	4.78	0.81	7.31	1.71	0.52	−2.09
Middle East & North Africa 1976–89; 1991–2001	14.72	4.70	0.80	25.54	0.12	0.06	−7.09
United Kingdom 1971–2001	3.70	5.21	0.32	1.20	0.00	0.00	7.38
United States 1970–2001	5.73	5.62	0.42	1.95	0.05	0.00	8.94

Source: Authors' calculations, using data from World Bank (2003).

Arrow et al. (2004)

The Wealth of Nations and the Wealth of Commons

The Wealth of Nations consists of:

- Privately Produced Capital (K_P)
- Human Capital (K_H)
- Social (Common) Capital (K_S), e.g. produced public capital
- Natural (Common) Capital (K_N), e.g. land, exhaustible and renewable resources

Optimality: Pure rate of time preference equal to returns of risk-free asset, social, private, natural, and human capital

$$\rho = r = F_{K_S}(K_S, K_P, K_H, K_N) - \delta K_S = F_{K_P}(K_S, K_P, K_H, K_N) - \delta K_P = \frac{\dot{l}}{p} + \frac{\dot{p}}{p} = h$$

Social rate of return equal for all forms of capital (i.e. "no arbitrage condition"), otherwise there is over- or under-investment.

Key question: Is there over- or underinvestment in any form of capital?

Social Under-Investment in Infrastructure?

Highway construction in the USA (Gramlich 1994):

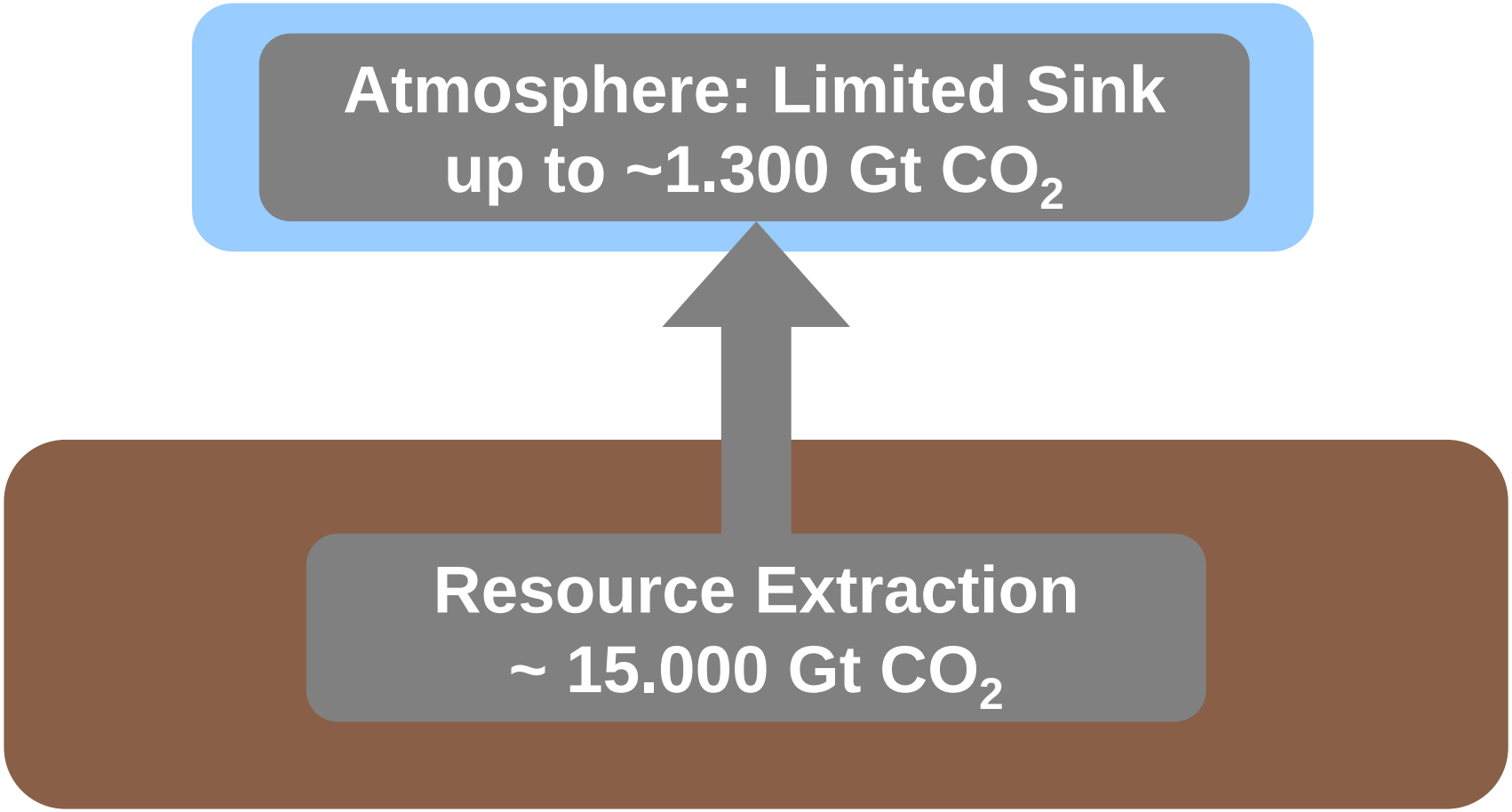
- maintenance projects: **35%**
- new urban construction projects: **15%**
- Rural construction projects: (low)

Return on ”ordinary“ investments in USA (1926-2000): **8.8 %**

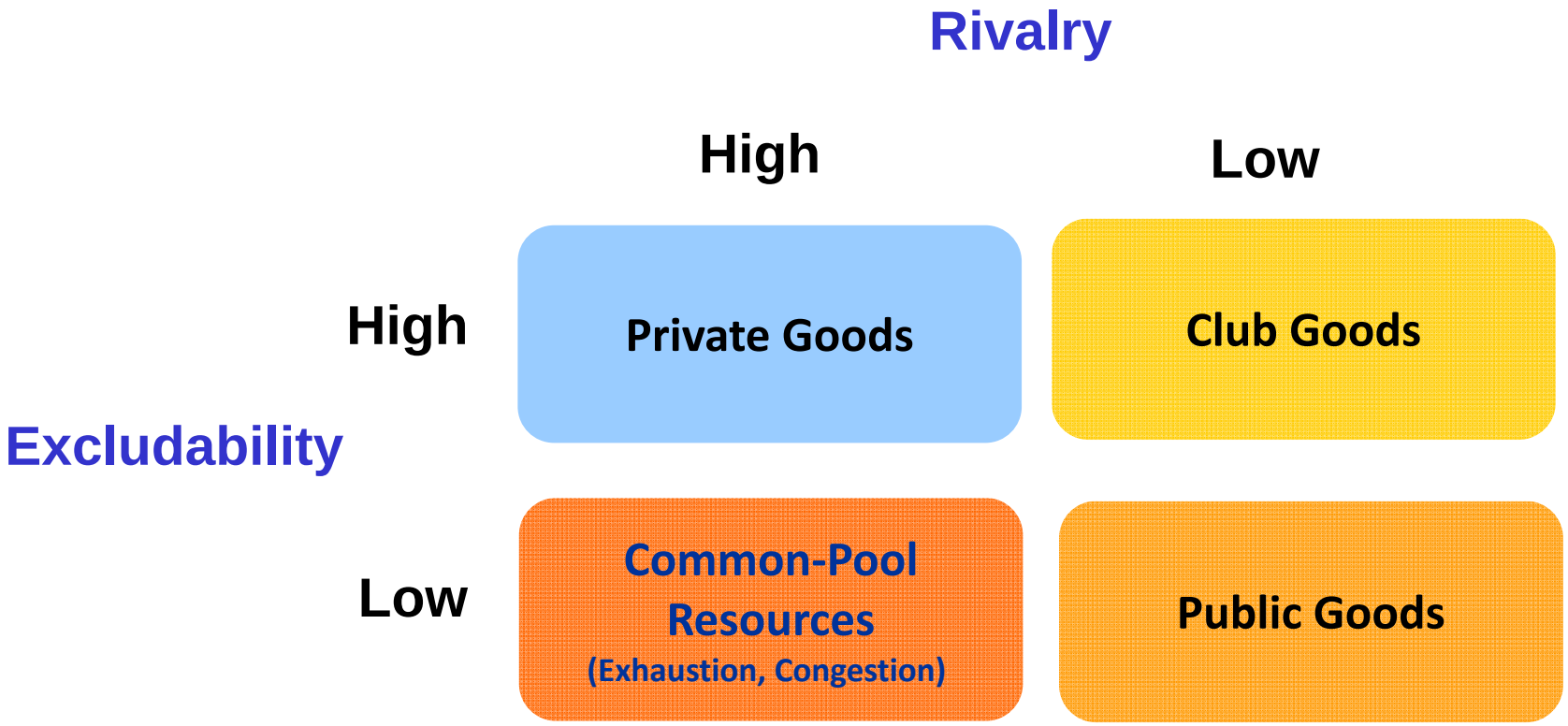
Positive correlation between growth and infrastructure stocks (Calderon and Serven 2004):

- 0.15 for phones
- 0.13 for power generating capacity
- 0.21 for road length

The Atmosphere as a Global Common



Why do Social Returns differ from Private Returns?



The central question for economic policy is not growth or degrowth, but welfare, for which common pool resources are a fundamental factor!

Commons: old Wine in new Bottles?

- Underinvestment in commons can be addressed by:
  - Appropriate choice of common property regimes, subsidies, taxes and public investment (financed by taxes).

- Rent taxation can in some cases increase efficiency and equity.

The central question for economic policy is not growth or degrowth, but welfare, for which common property regimes and public policies are a fundamental aspect!

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Conclusions

- Continued economic growth seems feasible, at least from the perspective of climate change mitigation, provided that externalities are properly addressed.

- Economic growth cannot be a goal in itself. But it could help to attain desirable objects (i.e. happiness, prosperity…).

- Public policy should not primarily be concerned with *growth*, but with *welfare*.

- Different members of society do not necessarily have to agree on a definition of welfare. But they have to agree on how to manage common pool resources and common property regimes.

The central question for economic policy is not growth, green growth, or degrowth, but *whether there is over- or underinvestment in common pool resources!*